

CLAIMS

1. A free piston device with a piston having a frequency of reciprocation over a stroke length and with first and second sides facing first and second variable volumes, respectively, for containing a working fluid, where the first and second volumes communicate via a clearance seal between the piston and a housing in which it reciprocates, the improvement comprising means for varying the geometry of the clearance seal in a manner coordinated with the cycle of piston reciprocation to produce time-varying seal geometry, such time-varying seal geometry reducing or eliminating the time-averaged flow of working fluid which would otherwise occur, thereby reducing or eliminating drift of the piston from its nominal center along the axis of reciprocation.

2. The free piston device of claim 1, where the time-varying seal geometry is produced by means comprising a piston with an outer shell which can grow or shrink radially in response to pressure forces.

3. The free piston device of claim 1, where the time-varying seal geometry is produced by means comprising a piston cylinder having an inner diameter which is bounded by fluid in the clearance seal, and at least part of the piston outer diameter is bounded by working fluid undergoing pressure oscillations, so that the cylinder diameter and the clearance seal gap grow or shrink in response to oscillating pressure forces.

4. The free piston device of claim 1, where the time-varying seal geometry is produced by means comprising a piston having a sealing surface which at least in part extends out of the seal during part of the reciprocation cycle.

5. The free piston device of claim 1, where the time-varying seal geometry is produced by means comprising a tapered piston bore, so that the effective seal gap is dependent on piston position in the bore.